

**COLORADO RIVER RECOVERY PROGRAM
FY-2020-2024 SCOPE OF WORK**

Project No. 163

Aspinall-related fish monitoring – Gunnison and Colorado rivers

Reclamation Agreement number: TBD

Reclamation Agreement term: October 1, 2019 – Sep. 30, 2024

Note: Recovery Program FY2020-2024 scopes of work are drafted in May 2019. They often are revised before final Program approval and may subsequently be revised again in response to changing Program needs. Program participants also recognize the need and allow for some flexibility in scopes of work to accommodate new information (especially in nonnative fish management projects) and changing hydrological conditions.

Lead Agency: U.S. Fish and Wildlife Service
Grand Junction Fish and Wildlife Conservation Office

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<u>Category:</u>	<u>Expected Funding Source:</u>
<input checked="" type="checkbox"/> Ongoing	<input checked="" type="checkbox"/> Annual funds
<input type="checkbox"/> Ongoing-revised project	<input type="checkbox"/> Capital funds
<input type="checkbox"/> Requested new project	<input type="checkbox"/> Other (explain)
<input type="checkbox"/> Unsolicited proposal	

I. Title of Proposal: Monitoring multiple life stages of the fish community in the lower Gunnison and upper Colorado rivers, with emphasis on Colorado pikeminnow and razorback sucker populations, in response to reoperation of the Aspinall Unit and implementation of the Selenium Management Plan.

II. Relationship to RIPRAP:
Gunnison River Action Plan: Gunnison River Mainstem
V. Monitor populations and habitat and conduct research to support recovery actions.
V.A. Conduct research to acquire life history information and enhance scientific techniques required to complete recovery actions.
Colorado River Action Plan: Colorado River Mainstem
V. Monitor populations and habitat and conduct research to

support recovery actions.

V.A. Conduct research to acquire life history information and enhance scientific techniques required to complete recovery actions.

III. Study Background/Rationale and Hypotheses:

The Programmatic Biological Opinion (PBO) for water depletions in the Gunnison River Basin (USFWS 2009) stipulates that endangered fishes, as well as the entire fish community, be monitored to determine the status of the species before and after the Selenium Management Plan (SMP) is implemented and following reoperation of the Aspinall Unit reservoirs. The PBO calls for monitoring of multiple life stages and density estimates of Colorado pikeminnow and razorback sucker in the lower Gunnison and Colorado rivers.

Density estimates can be calculated by first developing population estimates through mark-recapture techniques. The standard for monitoring populations of Colorado River endangered fishes is to periodically develop population estimates using closed-model capture-recapture methods. Such estimates provide information on population status (abundance), and when repeated periodically over an extended period can also provide information on population trends. Such estimates have been made for Colorado River populations of Colorado pikeminnow and humpback chub.

Because sub-adult and adult Colorado pikeminnow and razorback sucker are few and/or difficult to locate in the Gunnison River (Burdick 1995), the two species will be monitored using the fish community monitoring outlined below. Should numbers of endangered fish sufficient for mark-recapture estimates to be generated, a change in methodology will be considered. The approach used here was to first see (in the first two years of sampling: 2011 and 2012) if sufficient numbers of each could be captured to allow mark-recapture abundance estimation. This was to be accomplished with a limited sampling effort of only two electrofishing passes each year (see protocol below for fish community monitoring). It was anticipated that if sufficient numbers of endangered fish were caught to allow for generation of population estimates (and subsequently density estimates) annual sampling during 2013, 2014 and 2015 would be increased to five passes. Hence, the first two years were essentially a feasibility study for adult density estimation (number of individuals per unit area). Because 2011-2012 sampling failed to collect sufficient numbers of endangered fish to allow for generation of population estimates (and subsequently density estimates), monitoring in 2013 and outyears will continue to employ the less precise index of catch-per-unit-effort (number of fish caught per hour of electrofishing). This means continuing with two electrofishing passes per year, allowing comparison of catch rates through time, until such time that sufficient numbers of endangered fish are caught to allow for population and density estimates to be generated. The assumption inherent when using this index as a monitoring tool is that trends in

catch rates are indicative of underlying trends in abundance, although the level of actual abundance is never known or estimated. Since numbers of endangered Colorado pikeminnow and razorback sucker collected in 2011-2018 were well below the levels needed for generating population estimates, sampling in 2019 and beyond will continue with two electrofishing passes.

The fish assemblage in the Gunnison River will be monitored using electrofishing catch-per-effort as an index to track trends in relative abundance of each species. The assumption inherent when using catch per unit effort as a monitoring tool is that trends in catch rates are indicative of underlying trends in abundance, although the level of actual abundance is never known or estimated. Burdick (1995) conducted four passes of raft-based electrofishing to characterize the Gunnison River fish community in 1992 and 1993. He sampled once during pre-runoff, once during runoff, and twice during post-runoff. To allow comparison of our results with those of Burdick (1995), we will use a similar sampling protocol but scale back the number of electrofishing passes to two each year and conduct these only during the post-runoff period. It is during these two electrofishing passes that capture rates of endangered fish will be assessed to determine if mark-recapture abundance estimation will be feasible in subsequent years (see above).

For young-of-year (YOY) and small-bodied fish monitoring, we propose to use beach seine sampling of backwaters during fall (late September-early October) using ISMP methodology (see McAda 1994). Burdick (1995) found that Gunnison River backwater habitat was very scarce and therefore he deviated from the ISMP protocol (sampling two backwaters in every five-mile segment) by sampling every backwater encountered. We propose to follow Burdick's modification of the ISMP methodology in this regard.

Concurrent with 2011-2014 fish community monitoring in the Gunnison River, tissue samples were collected to determine selenium concentrations in fish before and after implementation of the SMP. Muscle plug samples were collected from all adult Colorado pikeminnow, razorback sucker, and bonytail encountered. In addition, from 2011-2014, muscle plug samples were collected from common carp and roundtail chub, as well as whole-body samples of speckled dace (ubiquitous species) to insure that statistical comparisons could be made regarding selenium in fish tissue before and during SMP implementation.

In the Colorado River, downstream of the Gunnison River inflow, the populations of adult Colorado pikeminnow and razorback sucker are already being monitored (Project 127) with mark-recapture abundance estimation (see Osmundson and White 2014). Distribution of any running ripe females collected will also be mapped to help ascertain spawning site locations. The assumption here is that improvement in flow regimes in the Gunnison River will have positive ramifications in the downstream Colorado River as well and hopefully result in benefits to endangered fish populations in both rivers.

Osmundson and Seal (2009) found increasing catch rates of razorback sucker larvae in the Colorado River from 2004 to 2007 and an apparent (non-significant) decrease in catch rates in the Gunnison River. Hand seine sampling for larval fish was performed from 2011-2018 in both rivers from mid-May to early-August, to encompass the spawning season for razorback sucker. This work will be continued in 2020-2024. Larval hand seine sampling will provide an index to reproductive success of each species using catch-per-effort (mean number per sample) of endangered fish larvae in both the Colorado and Gunnison Rivers. For razorback sucker larvae, results can be compared with those provided earlier (2002-2007) by Osmundson and Seal (2009). Colorado pikeminnow larval catch rates in the Colorado River could be compared with results provided by Osmundson and Burnham (1998) for the years 1986-1994.

Trends in large-bodied fish community composition and species relative abundance will also be monitored in the Colorado River in the 18-mile reach immediately downstream of the Gunnison River inflow. As in the Gunnison River, shoreline electrofishing will be used to generate annual catch-per-effort statistics as a monitoring index. The Interagency Standardized Monitoring Program (ISMP) of the 1980s and 1990s included an annual, adult, spring, electrofishing survey, but was designed to detect trends only in endangered species and thus no systematic sampling of the fish community was performed. The only systematic community sampling conducted under the auspices of the Recovery Program that could now serve as a baseline for future monitoring was the electrofishing sampling conducted in 1994 and 1995 as part of the food-availability study, Project No. 48-A (see Osmundson 1999). From 2011-2019, we replicated that sampling protocol and sample the reaches randomly selected and sampled at that time so results in coming years can be compared to those earlier catch rates. This work will also continue from 2020-2024.

IV. Study Goals, Objectives, End Product:

Goals

- 1) Continue the long-term, multi-life-stage, monitoring program for Colorado pikeminnow and razorback sucker populations in the Gunnison and Colorado rivers whereby population responses can be used to evaluate the effectiveness of implementation of Aspinall re-operation and the Selenium Management Program (SMP).
- 2) Determine selenium concentrations in endangered fish before and after implementation of the Selenium Management Program as a means to assess whether environmental selenium reductions result in concomitant reductions in endangered fish. The performance and reporting of this work will be done with funding other than Recovery Program funds.

Objectives

- 1) Continue long-term monitoring program for sub-adult and adult Colorado pikeminnow and razorback sucker in the lower Gunnison River while simultaneously bolstering existing monitoring efforts in the Colorado River by including abundance estimation of stocked razorback sucker.
- 2) Continue to evaluate reproductive success of endangered fish in the Gunnison and 18-mile reach of the Colorado rivers by performing early-life-phase abundance monitoring through systematic collections of larvae (hand seining) and young-of-the-year (beach seining).
- 3) Continue monitoring of the fish community in the Gunnison River and 18-mile reach of the upper Colorado River, including both large- (electrofishing) and small-bodied fish (beach-seining) using protocols modeled after Burdick (1995), Osmundson (1999) and ISMP young-of-year sampling (McAda et al. 1994).
- 4) Continue to determine selenium concentrations in Colorado pikeminnow, razorback sucker, and bonytail inhabiting the Gunnison River, downstream of delta, CO. The performance and reporting of this work will be done with funding other than Recovery Program funds.

End Product

A final report detailing study findings, including results of endangered and sympatric fish community monitoring -- adult, YOY, and larval sampling (to be produced by GJ FWCO - Grand Junction). In addition, a final draft of the report detailing the results of selenium concentrations found in fish samples (to be produced by Grand Junction, CO Ecological Services field station; work to be funded outside of the Recovery Program) has been provided to the Recovery Program as a courtesy.

Fish Community Monitoring Report:

Draft report ready for peer review on August 30, 2022.

Draft final ready for approval consideration October 31, 2022.

Report finalized November 31, 2022.

Larval Fish Monitoring Report:

Included as appendix in the Fish Community Monitoring Report

Contaminants Report (funded outside of the Recovery Program):

V. Study Area:

Large-bodied fish, YOY, and larval fish will be sampled along shorelines and zero-velocity habitats of the lower Gunnison River from Hartland Diversion Dam (RM 59.9) downstream to a point immediately upstream from the Redlands Diversion Dam near Grand Junction (RM 3). In the Colorado River, large-bodied fish will be sampled in sub-reaches of the 18-mile reach extending downstream from the Gunnison River inflow (RM 171) downstream to the Colorado-Utah state line. Fall YOY sampling will occur throughout the same 18-mile reach and extend downstream to the Colorado-Utah line to stay consistent with the former ISMP YOY sampling area. Larval sampling in the Colorado River will be conducted from the Gunnison River inflow downstream Colorado/Utah stateline.

VI. Study Methods/Approach:

Due to Program budget limitations in 2020 and 2021, the number of larval sampling passes in the Colorado and Gunnison Rives will be reduced by one pass.

Gunnison River

Colorado pikeminnow and razorback sucker capture rates will be monitored by sampling the entirety of the Gunnison River study area. Larval sampling will be conducted four days per week from mid-May through the mid-July, or about 9 weeks each year. One complete pass can be made through the study area in four days. For larval seine sampling, the study area will be divided into 5-mile segments and 1-6 sites will be sampled per segment each week, depending on availability of low-velocity habitats, consistent with methods used by Osmundson and Seal (2009). An investigator will spend about five minutes at each site seining with a one-person, two-handled, fine-meshed seine. River-mile location of each site will be noted, as well as presence or absence of larvae. If larvae are found, they will be preserved in individually labeled bottles of 100% ethanol. Larval collections will be sent to the Larval Fish Laboratory at Colorado State University for specimen identification and archiving.

For YOY sampling, one trip will be made each fall during sometime between mid-September and mid-October, consistent with Burdick (1995). In general, the protocol used by the Interagency Standardized Monitoring Program (ISMP) for YOY sampling will be followed (see McAda et al. 1994). However, because backwater habitat is scarce in the Gunnison River, most if not all backwaters encountered will be sampled, rather than hoping to sample two in each 5-mile reach, as stipulated in the ISMP. Two non-overlapping hauls will be made in each backwater. A 30-foot-long x 6-ft-deep 1/8 inch mesh seine or a 15-foot-long x 4-ft-deep 1/8 inch mess seine will be used depending upon the size of the habitat to be sampled. Size of seine used at each backwater will be recorded to calculate

area sampled. Fish that can be identified in the field will be counted and released; others will be preserved in 100% ethanol and sent to the Larval Fish Lab for enumeration. Area seined at each backwater will be recorded so that catch-per-effort can be calculated in terms of fish per unit area.

Large-bodied fish community sampling will follow the protocol established by Burdick (1995), who followed that of previous FWS investigators (Archer et al. 1980; Miller et al. 1982). The study area will be divided into the four primary study strata described by Burdick (1995) varying in length from 11.3 to 17.9 miles. Burdick selected one 5.5-mile sub-reach (starting mile selected from a random numbers table) within each stratum each time a pass was made; hence, sampling reaches were not consistent through time. Because we will make fewer annual passes than did Burdick, it is possible that such a method may not provide a good annual representation of the fish or habitat of each stratum, making among-year comparisons of catch rate difficult. We will therefore deviate from this protocol by sampling smaller sub-reaches within each stratum and spreading them out spatially so as to assure better geographic coverage and representation of each stratum. Three sub-reaches will be selected randomly within each stratum and each will consist of one riffle-run, meander sequence (approximately 0.5-2.0 miles long); these same three sub-reaches will be sampled each time an electrofishing pass is made. Most reaches (between available launch sites) in the Gunnison River downstream of Delta are long and electrofishing crews will need to camp as they proceed downriver. One week will be required to complete one shocking pass. Two post-runoff electrofishing passes will be completed annually, one in late July or early August and the other in either late September or early October.

Two 2-person crews will electrofish the right and left shorelines simultaneously, in a downstream direction, using either rafts or hard-bottomed boats. Electrofishing crews will attempt to collect all stunned fish within these sub-reaches. Fish will be worked up separately for each sub-reach and shocking time recorded for each. All fish collected in these sub-reaches will be identified by species, enumerated by life-stage (based on species-specific length classes), weighed (to the nearest gram), and measured (to the nearest mm total length {TL}). All T&E fish (bonytail, Colorado pikeminnow, and razorback sucker), as well as roundtail chub (in support of CPW's 3-species monitoring), collected in these sub-reaches will follow that same protocol, but they will also be checked for the presence of a PIT tag. Endangered fish species will have a muscle plug taken from them (see below). If no PIT tag is present in a T&E fish, one will be implanted. Roundtail chub will neither be PIT-tagged nor have muscle plugs taken. All native fish will be returned alive to the river.

In the sections of river separating sub-reaches, electrofishing will continue to be conducted. However, only T&E fish will be collected in these "in-between" sections of river. This will allow complete coverage for endangered fish sampling (see above). Handling protocols for T&E fish collected in these "in-between"

areas will be the same as those listed above.

As they are needed for (and work is funded by) studies outside of the Recovery Program, muscle plugs may be taken from adult Colorado pikeminnow, razorback sucker, and other sympatric species, following procedures specified by Williamson (1992). Muscle plugs will be taken using a 5-mm biopsy punch. A different punch will be used on each fish and discarded after use. Muscle plugs will be taken 1 to 2 cm below the dorsal fin by inserting the punch with a slight twisting motion. Tilting the punch allows the tissue sample to break off at the end. The sample will be emptied into sterile cryogenic vials, placed on dry (or wet) ice in the field until they are eventually frozen. Wounds will be disinfected using betadine swabs, to decrease the chance of infection. Selenium analyses will be conducted by neutron activation, which is the method of choice for selenium analysis on small biomass samples. Up to 30 muscle plug (MP) samples may be taken in a given year (10 adult razorback; 10 adult pikeminnow; 10 bonytail).

Colorado River

The fish community sampling protocol established during Project 48-A (see Osmundson 1999) will be repeated in the 18-mile reach. At that time, the river from Rifle to Westwater was stratified by geomorphology and tributary input. On aerial photos, each of five strata was divided into multiple reaches, each consisting of one meander (riffle-run) sequence 0.5-1.2 miles long. The reaches were numbered and three study reaches were selected within each stratum using a random numbers table. The 18-mile reach was one of the strata and the three study reaches selected within the 18-mile reach then will continue to be sampled for this SOW. Both shorelines will be sampled with boat electrofishing. To keep effort consistent with the earlier methods, two netters will be stationed at the front of each boat. Fish will be identified, measured for TL, and weighed. Two boats with a crew of three people each will be needed. One deviation from the earlier design, however, will be to reduce costs by sampling only once per year in the fall (Sep-Oct), instead of both spring and fall.

Larval sampling will follow the protocol outlined above for the Gunnison River, extending from mid-May through the first week of August for razorback larvae. If at some point it is deemed feasible to begin sampling for larval Colorado pikeminnow, that sampling would occur from mid-June through the end of August (pending available funding, personnel, and equipment). The 18-mile reach and from Loma downstream to the Colorado-Utah state line will be sampled for comparison with results of Osmundson and Seal (2009).

Fall YOY sampling will be restricted to the 18-mile reach and Loma downstream to the Colorado-Utah state line, following ISMP protocol with two seine hauls in each of two backwaters within each 5-mile reach (see McAda et al. 1994).

The Principal Investigator will train crew members, act as overall crew leader and

actively participate in data collection efforts. Along with annual data collection efforts, additional time will be required prior to field sampling to ready equipment and train new crew members in motor boat operation and field techniques specific to this project and later to input and check data.

VII. Task Description and Schedule

Description

- Task 1. Electrofish Gunnison River for endangered fish CPE, fish community monitoring, and fish tissue collection; two trips (late July or early August and late-September or early-October).
- Task 2. Electrofish Colorado River for fish community monitoring; one trip (late September or early October).
- Task 3. Sample fish larvae (mid-May to early August): Colorado River
- Task 4. Sample fish larvae (mid-May to early August): Gunnison River
- Task 5. Sample YOY in the Gunnison River (one pass – in late September or early October)
- Task 6. Sample YOY in the Colorado River (one pass – in late September or early October)
- Task 7. Analyze tissue samples for selenium
- Task 8. Analyze larval samples (Larval Fish Lab)
- Task 9. Analyze data
- Task 10. Write annual reports
- Task 11. Prepare final contaminants report (Barb Osmundson)
- Task 12. Prepare final fish monitoring report No. 1 (Large-bodied and YOY fish)
- Task 13. Prepare final fish monitoring report No. 2 (Larval fish)

Schedule

Task 1, 2, 3, 4, 5, 6, 8, 9, 10:	2020
Task 1, 2, 3, 4, 5, 6, 8, 9, 10:	2021
Task 1, 2, 3, 4, 5, 6, 8, 9, 10, 12:	2022
Task 1, 2, 3, 4, 5, 6, 8, 9, 10, 13:	2023
Task 1, 2, 3, 4, 5, 6, 8, 9, 10:	2024

VIII. Deliverables, Due Dates, and Budget by Fiscal Year: Budget Summary:

Annual report submission by November each year and data submissions to STReAMS by the following January.

Submission of 6-12 photos of project components or individuals completing tasks by February 28th. Images can be uploaded to;

<https://www.flickr.com/photos/coloradoriverrecovery/>

Photographs will likely be taken with cell phone phones and uploaded photos to a folder named by project number. Each image will have a number, and an email will be sent to the I&E Coordinator with the number and a brief description of the photo. For example, date, location, what is happening and who the photographer is.

Please see Interagency Agreement Cost Estimating Tool Spreadsheet Budget Summary.

FY-2020	
USFWS- GJFWCO	\$106,712.64
CSU Larval Fish Lab – funded separately	

FY-2021	
USFWS- GJFWCO	\$ 88,723.99
CSU Larval Fish Lab – funded separately	

2020-2021 Total = \$195,436.63

Estimated Budget Summary for Fiscal Years 2022-2024:

FY-2022	
USFWS- GJFWCO	\$ 94,046.61
CSU Larval Fish Lab – funded separately	

FY-2023	
USFWS- GJFWCO	\$116,992.07
CSU Larval Fish Lab – funded separately	

FY-2024	
USFWS- GJFWCO	\$ 98,162.33
CSU Larval Fish Lab – funded separately	

2022-2024 Total = \$309,201.01

5-Year Total = \$504,637.64

IX. Reviewers: Program staff and Biology Committee

X. References

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